

REMARKS / ARGUMENTS

Disposition of the Claims

Claims 17, 20 to 22, 24 to 28 and 30 to 31, as amended, and newly added claim 32 are pending in the present application. Applicants respectfully request continued examination of Claims 17, 20 to 22, 24 to 28 and 30 to 31, as amended, and newly added claim 32 and allowance of all pending claims.

Amendments to the Claims

Claims 16 and 19 have been cancelled as the content of these claims have been incorporated into claims 30 and 31. Claim 30 has also been amended to indicate that the absorbing gases are selected from the group consisting of saturated hydrocarbons, unsaturated hydrocarbons, CO₂, CO, H₂O, NH₃, NO, N₂O, NO₂ and mixtures thereof. Claims 20, 21 and 22 have been amended to correct dependency in view of the cancellation of claim 16. Claim 32 which depends from claim 30 has been added to indicate that the gas mixture can be a binary mixture selected from a CO₂/He mixture and a CO₂/H₂ mixture wherein in each of these mixtures the CO₂ content is between about 20% to about 80% of the total mixture volume.

35 U.S.C. § 102(b) Rejection

In the Final Office Action, the Examiner rejected claims 16, 17, 22, 24, 30, and 31 under 35 U.S.C. § 102(b) as being anticipated by Stratton et al, WO 02/44430, (hereinafter "Stratton"). This rejection is respectfully traversed with regard to claims 17, 22, 24, 30 and 31, as amended.

Claims 30 and 31, as amended, are not anticipated by Stratton since the content of claim 19 which was not rejected as being anticipated by Stratton has been incorporated into claims 30 and 31. Claims 17, 22, and 24 each depend either directly or indirectly from newly amended claim 30. Accordingly, since claim 30, as amended, is not anticipated by Stratton, Applicants maintain that claims 17, 22 and 24 are also not anticipated by Stratton.

In view of the above, Applicants maintain that claims 17, 22, 24, 30 and 31, as amended, are patentable over Stratton and respectfully request that the rejection of these claims under 35 U.S.C. § 102(b) be withdrawn.

First 35 U.S.C. § 103 Rejection

In the Final Office Action, the Examiner rejected Claim 25 under 35 U.S.C. § 103(a) as being unpatentable over Stratton. This rejection is respectfully traversed since Stratton teaches against the present invention.

Stratton teaches a method of quenching a hot metal object using a hot gas stream comprising at least 20% by volume of hydrogen. In addition, the hot gas may contain from 40 to 60% by volume of nitrogen, from 12 to 20% by volume of carbon monoxide, with smaller amounts of other gases such as methane, water vapour, and carbon dioxide typically also being present." Accordingly, Stratton teaches a mixture of hydrogen, nitrogen, and carbon monoxide with small amounts of methane, water vapour and carbon dioxide.

Claim 25 of the present invention depends indirectly upon claim 30 of the present invention which provides for a method for rapidly cooling metal parts using a pressurized cooling gas mixture that includes one or a plurality of gases selected from the group consisting of saturated hydrocarbons, unsaturated hydrocarbons, CO₂, CO, H₂O, NH₃, NO, N₂O, NO₂ and mixtures thereof and optionally an additive gas selected from the group consisting of hydrogen, helium and mixtures thereof. Claim 25 provides that the absorbing gas in the mixture be between 20% and 80% of the total mixture volume. Therefore, while the mixture of Stratton requires the inclusion of nitrogen, the present invention does not. In fact, it is noted in the background of the present invention that "the gas most commonly used for cooling is nitrogen, because it is an inert and inexpensive gas". The background goes on to provide that "it is known, in gas hardening systems, that the temperature must be

lowered as rapidly as possible for the steel transformation to occur satisfactorily, from the austenitic phase to the martensitic phase without passing through the pearlitic and/or bainitic phases...[h]owever, it has been observed that in certain critical cases, nitrogen quench hardening installations are not suitable for obtaining a sufficient temperature lowering rate." Accordingly, Applicants maintain that Stratton, while teaching a method for quenching a hot metal object, teaches against the present invention since Stratton teaches the inclusion of nitrogen as one of the components in the gas mixture.

In view of the above, Applicants maintain that claim 25 is not obvious in view of Stratton and accordingly, request that the rejection of this claim under 35 U.S.C. § 103(a) as being unpatentable over Stratton be withdrawn.

Second 35 U.S.C. § 103 Rejection

In the Final Office Action, the Examiner rejected Claim 19 under 35 U.S.C. § 103(a) as being unpatentable over Stratton in view of Baxter, U.S. Patent No. 5,173,124 (hereinafter "Baxter"). Claim 19 has been cancelled. Therefore, Applicants maintain that this rejection is moot in view of this cancellation.

Third 35 U.S.C. § 103 Rejection

In the Final Office Action, the Examiner rejected Claim 28 under 35 U.S.C. § 103(a) as being unpatentable over Stratton in view of Anderson, U.S. Patent No. 5,938,866 (hereinafter "Andersson"). This rejection is respectfully traversed.

This rejection is respectfully traversed on the basis that Stratton teaches against the present invention since Stratton teaches the inclusion of nitrogen as one of the components in the gas mixture and Andersson does not overcome this deficiency.

In the Office Action, the Examiner notes that Stratton does not disclose recycling of the quenching gas. The Examiner relies upon Andersson for the recycling component of the process and notes that it would have been obvious to one of ordinary skill in the art to apply Andersson's steps of compression and purification to the method of Stratton in order to facilitate the recycling of a quenching gas thereby increasing the efficiency of the installation system. Applicant's respectfully disagree.

As noted in the previous response to the rejection under 35 U.S.C. § 103(a) involving Stratton, Stratton teaches against the present invention since Stratton teaches the inclusion of nitrogen as one of the components in the gas mixture as discussed hereinbefore. Andersson does not overcome this deficiency.

Accordingly, Applicants maintain that claim 28 is not rendered obvious when considered in view of Stratton and Andersson. Applicants therefore request that the rejection of claim 28 under 35 U.S.C. § 103(a) as being unpatentable over Stratton in view of Andersson be withdrawn.

Fourth 35 U.S.C. § 103 Rejection

In the Final Office Action, the Examiner rejected Claims 16, 17, 20 to 22, 24 to 27 and 30 under 35 U.S.C. § 103(a) as being unpatentable over Wandke, EP 0869189, (hereinafter "Wandke") combined with Boyer, U.S. Patent No. 5,798,007 (hereinafter "Boyer"), Lemken, U.S. Patent No. 6,428,742 (hereinafter "Lemken") and Nakamura, JP 63149313 (hereinafter "Nakamura"). This rejection is respectfully traversed with regard to claims 17, 20 to 22, 24 to 27 and 30, as amended, and newly added claim 32.

Claim 30 of the present invention, as amended, from which claims 17, 20 to 22, 24 to 27 and 32 depend either directly or indirectly, provides for a method for rapidly cooling metal parts using a pressurized cooling gas mixture. The pressurized

cooling gas mixture comprises one or a plurality of infrared radiation absorbing gases selected from the group consisting of saturated hydrocarbons, unsaturated hydrocarbons, CO₂, CO, H₂O, NH₃, NO, N₂O, NO₂ and mixtures thereof and an optional additive gas selected from the group consisting of hydrogen, helium and mixtures thereof. In addition, claim 30 further provides for adjusting the composition of said mixture to optimize the mixture's convective heat transfer coefficient, compared to the individual convective heat transfer coefficients of each component of the mixture and that the composition of the mixture is adjusted to obtain an average mixture density that is approximately the same as that of nitrogen.

Wandke provides for a method for the gas quenching of metal workpieces after heat treatment in a heat treatment furnace. Wandke references power consumption ability and thermal capacity. However, Applicants maintain that Wandke is merely attempting to optimize the classical notions of heat capacity and thermal conductivity. Wandke does so by providing for quenching using helium, hydrogen, mixtures of helium and hydrogen, or such mixtures with an additional inert gas as the quenching medium, the additional inert gas possibly being carbon dioxide. However, as noted by the Examiner, Wandke does not disclose adjusting the composition to obtain an average mixture density that is approximately the same as nitrogen. Wandke does not provide for the optimization of the IR absorption capacity of the quenching gases chosen.

In order to overcome these deficiencies, in the Office Action the Examiner cites a variety of secondary references. The Examiner relies upon Boyer for the position that quenching installations are designed for a particular quenching medium; Lemken for the position that the density of the cooling gas associated therewith affecting the design and strength of the quenching installation in terms of power; and Nakamura for the position that coolant nitrogen gas is circulated in a closed vessel via a circulating fan. However, Applicants maintain that these references whether considered alone or in combination with Wandke fail to overcome the deficiencies

noted above with regard to Wandke. Applicants maintain that the secondary references fail to provide for the use of a gas mixture having an average mixture density that is approximately the same as that of nitrogen. While Nakamura discloses the use of a coolant gas that is nitrogen, Applicants note that the coolant gas in the present application is not nitrogen—it is instead a gas mixture having an average mixture density that is approximately the same as that of nitrogen.

Accordingly, one skilled in the art considering Wanke and the secondary references would not be led to utilize a gas mixture that has an average mixture density that is approximately the same as that of nitrogen simply because nitrogen has been used as a coolant gas previously.

In view of the above, Applicants maintain that claims 17, 20 to 22, 24 to 27, and 30, as amended, and newly added claim 32 are not rendered obvious when considered in view of Wandke in combination with Boyer, Lemken and Nakamura. Accordingly, Applicants respectfully request that the rejection of these claims under 35 U.S.C. § 103(a) be withdrawn.

Fifth 35 U.S.C. § 103 Rejection

In the Final Office Action, the Examiner rejected Claim 19 under 35 U.S.C. § 103(a) as being unpatentable over Wandke, in view of Boyer, Lemken, Nakamura, and in further view of Baxter. Claim 19 has been cancelled. Therefore, Applicants maintain that this rejection is moot in view of this cancellation.

Sixth 35 U.S.C. § 103 Rejection

In the Final Office Action, the Examiner rejected claim 28 under 35 U.S.C. § 103(a) as being unpatentable over Wandke, in view of Boyer, Lemken, Nakamura and in further view of Andersson. This rejection is respectfully traversed.

Claim 28 depends directly from claim 30. Accordingly, the same arguments made with regard to the Fourth 35 U.S.C. § 103(a) Rejection as it applies to Wandke, Boyer, Lemken and Nakamura is applicable. Applicants maintain that Andersson does not overcome the deficiencies noted above. Accordingly, Applicants maintain that claim 28 is patentable when considered in view of Wandke, Boyer, Lemken, Nakamura, and Andersson combination. Applicants therefore request the withdrawal of the rejection of claim 28 under 35 U.S.C. § 103(a).

Seventh 35 U.S.C. § 103 Rejection:

In the Final Office Action, the Examiner rejected Claim 31 under 35 U.S.C. § 103(a) as being unpatentable over Wandke, in view of Boyer, Lemken, and Nakamura. This rejection is respectfully traversed.

Applicants maintain that the same arguments made with regard to the Fourth 35 U.S.C. § 103(a) Rejection are applicable to the present rejection. Accordingly, Applicants maintain that claim 31, as amended, is patentable when considered in view of Wandke, Boyer, Lemken, and Nakamura. Applicants therefore request the withdrawal of the rejection of claim 31 under 35 U.S.C. § 103(a).

CONCLUSION

In view of the above, Applicants maintain that Claims 17, 20 to 22, 24 to 28, 30 and 31, as amended, and newly added claim 32 are now in condition for allowance. Early notice to this effect is earnestly solicited. Should the Examiner believe a telephone call would expedite the prosecution of the present application, the Examiner is invited to call the undersigned attorney at the number listed below.

Respectfully submitted,

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